QUALITY ASSURANCE PROJECT PLAN FOR BROWNFIELDS/VOLUNTARY CLEANUP PROGRAM SITES

Prepared by the
Missouri Department of Natural Resources
Division of Environmental Quality
Hazardous Waste Program
Brownfields/Voluntary Cleanup Section

Missouri Department of Natural Resources
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A. PROJECT MANAGEMENT ELEMENTS

A.1 TITLE AND APPROVAL SHEET

Brownfields/Voluntary Cleanup Program
Quality Assurance Project Plan
Missouri Department of Natural Resources
Division of Environmental Quality

DEPARTMENT APPROVALS

John Madras — Division Quality Assurance Manager — 9/26/05 — Date

Richard Hall — Director, Hazardous Waste Program — 9/22/05 — Date

Carey Bridges — BVCP Quality Assurance Project Officer, HWP — 9/19/05 — Date

CONTRACTOR APPROVALS

Director, Contractor — Date

Project Manager, Contractor — Date

Project Field Superintendent, Contractor — Date

QA/QC Manager, Contractor — Date

A.2 TABLE OF CONTENTS

A.3 DISTRIBUTION LIST

Missouri Department of Natural Resources (MDNR)
John Madras – Quality Assurance Manager, Environmental Policy Director, Division of Environmental Quality (DEQ)

Hazardous Waste Program (HWP)
Bob Geller – Director
Jim Belcher – Environmental Manager, Brownfields/Voluntary Cleanup Section
Carey Bridges – Quality Assurance Project Officer, BVCP
Project Managers – Brownfields/Voluntary Cleanup Section

Contractor/Consultant (contractor)
Director - Contractor
Project Manager–Contractor
Project Field Superintendent –Contractor
Contractor/Consultant/Laboratory – Quality Assurance Project Plan Coordinator

A.4 PROJECT/TASK ORGANIZATION

The following list identifies key individuals and organizations participating in this project, and discusses their specific roles and responsibilities as they pertain to this Quality Assurance Project Plan (QAPP).

Project Manager - Brownfields/Voluntary Cleanup Section, HWP
Responsibilities: Oversight of site-specific activities as they relate to this QAPP, including correspondence, communication and scheduling. Review and approve plans, reports, and data to ensure that site-specific activities conducted pursuant to this QAPP meet project-specific Data Quality Objectives (DQOs).

John Madras – Environmental Policy Director, DEQ
Responsibilities: Monitors the overall Quality Assurance (QA) operations for the division. Develops and maintains the Quality Management Plan (QMP). Reviews and approves all QAPPs for the division.

Project Manager –Contractor
Responsibilities: Supervise and schedule field staff conducting sample collection and site assessment activities. Assures that staff are qualified and trained to perform the work, familiar with the required Standard Operating Procedures (SOP), including those related to Quality Assurance/Quality Control (QA/QC), and have the equipment necessary to perform the work. Reviews reports generated by staff for completeness, clarity and accuracy. Prepare formal reports for BVCP staff review and approval.

Project Field Superintendent - Contractor
Responsibilities: Prepare and/or implement site-specific sampling plans to collect environmental samples according to contractor SOPs at potential and/or confirmed hazardous substance sites. Conduct sample collection by appropriate

methods to provide data of sufficient quality. Prepare and/or implement health and safety plans for investigations conducted by the contractor at potential and/or confirmed hazardous substance sites. May prepare formal reports of sampling investigations for BVCP staff to evaluate.

QA/QC Manager - Contractor
Responsibilities: Reviews site-specific QAPPs and other documents as needed to ensure quality data. Performs field audits of contractor staff who conduct sampling activities in order to verify that staff are following the contractor SOPs for environmental data collection. Prepares audit reports summarizing procedures used and makes recommendations for improvement, if necessary.

Contractor/Consultant/Laboratory – Quality Assurance Project Plan Coordinator
Responsibilities: Ensures that appropriate analytical methods, Laboratory SOPs, QA/QC procedures, documentation, and training are implemented and routinely followed by all supervisory and technical staff of the contractor. Utilizes data review checklists and QC charts for both precision and accuracy data in the data quality review process. Conducts reviews of data files following review and approval by Laboratory supervisory staff.

Director - Contractor
Responsibilities: Ensures overall validation and final approval of data generated by the contractor. Assists as appropriate in the performance auditing of all activities performed by contractor personnel.

A.5 PROBLEM DEFINITION/BACKGROUND

The Brownfields/Voluntary Cleanup Program, administered by the Missouri Department of Natural Resources Hazardous Waste Program's Brownfields/Voluntary Cleanup Section (BVCP), provides voluntary parties with technical assistance and oversight for the investigation and cleanup of properties contaminated with hazardous substances. The goal of the BVCP is to clean up contaminated properties and bring them back into productive use.

Environmental assessments of commercial and industrial property are part of many real estate transactions and often are required by lenders and buyers as a result of the liability provisions of the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or Superfund law. If contamination is found, property owners or other interested parties often want not only to clean up the property, but also to obtain a certificate of completion or "clean letter" from the state, which provides a measure of environmental liability protection. Hazardous substance contamination is not always regulated under state and federal laws such as Superfund, the Resource Conservation and Recovery Act (RCRA), or state petroleum storage tank regulations. The contamination may be of a type or concentration that does not warrant enforcement action and may not require cleanup under existing regulations. The BVCP may be the only program with the authority to provide oversight of the cleanup and a certification of completion.

The BVCP can provide guidance so that the cleanup satisfies any applicable state and federal regulations and also provides written assurance when the project is complete. Missouri's Hazardous Substance Environmental Remediation (Voluntary Cleanup Program) Regulations (10 CSR 25-15.010) in accordance with sections 260.565 – 260.575, RSMo, provide the Hazardous Waste Program's Brownfields/Voluntary Cleanup Section with the resources and the authority to provide project oversight and completion letters. Oversight costs are paid to the department by the participant. By a memorandum of agreement with the U.S. Environmental Protection Agency (EPA), Region 7, the EPA will not pursue federal action with regard to the contamination addressed at the site once the BVCP issues a certificate of completion.

The Missouri Department of Natural Resources operates under its Quality Management Plan (QMP) when collecting or overseeing the collection of environmental sampling data. This plan requires that any subgrantees, contractors, or, in some cases, the regulated community, who generate environmental data develop QAPPs or other appropriate quality management tools. The QMP covers all intramural and extramural monitoring and measurement activities that generate and process environmental data for use by the department, including activities at sites participating in the BVCP.

This QAPP is generic in that it applies to several site-specific projects under the oversight of the BVCP. It is ongoing in that the projects are conducted continuously. A site-specific work plan detailing site activities will be submitted to the BVCP Project Manager for approval prior to any work conducted under the oversight of the BVCP. Any deviations from or supplemental activity to the generic QAPP will be documented in a Site-Specific Quality Assurance Project Plan Addendum (SSQA).

A.6 PROJECT/TASK DESCRIPTION

When a site enters the program, the BVCP reviews existing site assessment reports and determines whether or not additional investigation or cleanup is required to meet state standards. The site investigation and any necessary cleanup are conducted by the applicant or their consultants and contractors. Site assessment reports, remedial action plans and a final report are submitted to the BVCP for review and approval. When the BVCP is satisfied that the cleanup has met the objectives, the department provides the applicant with a Certification of Completion or "No Further Action Letter" signed by the Director of the Hazardous Waste Program. Applicants pay for the BVCP's oversight costs, which are calculated on an hourly basis. Participation in the program is voluntary and applicants may withdraw at any time.

Activities that may be conducted under this QAPP and with the oversight of the BVCP include site characterization, remedial action and risk management. These activities will be documented through work plans for site characterization, characterization reports, risk assessment reports, remedial action plans (RAP), risk management plans (RMP), and final reports, all submitted to the BVCP for review and approval. The following include the necessary components for work plans to conduct environmental data collection submitted for BVCP approval and the necessary QA/QC documentation to be submitted after data collection.

A.6.1 Work Plans For Site Characterization

The contractor will submit the written site-specific work plan to BVCP for review and approval prior to implementation. These work plans should include a sampling and analysis plan, a field sampling plan, a health and safety plan, signature page and reference to this generic QAPP and a SSQA if applicable. The work plan will provide general site information, describe the number, type, and location of samples to be collected (included on a site sketch) as well as analytical parameters and methods requested for each sample.

A.6.2 Characterization Reports

The contractor will submit the written site-specific characterization report, including risk assessment reports, to the BVCP upon completion of site characterization activities. These reports should include field QA/QC documentation requirements and laboratory QA/QC documentation requirements as described in Section A.8 Documents and Records.

A.6.3 Remedial Action Plans/Risk Management Plans

If the RAP or RMP involves environmental data collection such as further site characterization, confirmatory samples following remedial activities, or monitoring, then the RAP/RMP shall be subject to this QAPP. The contractor will submit the written site-specific RAP/RMP to BVCP for review and approval prior to implementation. These plans should include a sampling and analysis plan, a field sampling plan, documentation of the health and safety plan, signature page and reference to this generic QAPP and a SSQA if applicable. The plan will provide general site information, describe the number, type, and location of samples to be collected (included on a site sketch) as well as analytical parameters requested for each sample.

If the RAP/RMP does not involve environmental sampling, then data QA/QC would not be a component.

A.6.4 Remedial Action/Risk Management Reports

If the RAP/RMP involves environmental sampling, then the contractor will submit to the BVCP a written site-specific report that includes field QA/QC documentation requirements and laboratory QA/QC documentation requirements as described in Section A.8 Documents and Records.

A.6.5 Modifications to the Work Plans

BVCP will have the final approval of all individual components of the written work plans revised as specified herein and reserves the right to require modifications, deletions, and or additional elaboration to the written work plans and reports as BVCP deems necessary.

A.6.5.1 BVCP requested changes

If BVCP determines that modifications to the written work plan are necessary or desired, the agency will document the requested changes to the contractor in writing. Such changes may include the need for additional sampling at the site. Based on the written instructions provided by BVCP, the contractor will revise the written work plan.

A.6.5.2 Contractor requested changes

If the contractor determines that modifications to the written work plan are necessary, the contractor will submit a written request to BVCP for changes. The written request will include the reason for the modification and will detail the contractor's proposed changes to the written work plan. BVCP will review the written request of the contractor and send written notice of approval or disapproval of the request to the contractor.

A.6.5.3 Field Deviations from the Work Plan

Changes in site conditions between the time of the site reconnaissance and the on-site sampling visit and the visual appearance of the substance at the time of sampling may determine the actual number and locations of samples collected. The deviations or changes will be documented in the final report prepared by the contractor and submitted to the BVCP.

A.7 DATA QUALITY OBJECTIVES AND CRITERIA

Data Quality Objectives are qualitative and quantitative statements that specify the purpose, quality, and/or quantity of the environmental data required to support management and remedial decisions at the site. DQOs are predicated in accordance with the anticipated end uses of the data that is to be collected. Data collected typically will be used to meet the following DQOs:

- Determine if there is an immediate threat to public health or the environment.
- Locate and identify potential sources of contamination.
- Characterize the extent of impact from contamination.
- Determine if there is a long-term risk from exposure to the site.
- Determine potential remediation and long-term stewardship strategies (if necessary).

When analyzing environmental samples, all measurements will be made so that results are reflective of the medium and conditions being measured. The level of detail and data quality needed will vary with the intended use of the data. DQOs typically are assessed by evaluating the precision, accuracy, representativeness, completeness, and comparability of all aspects of the data collection process, defined as follows:

- **Precision**: a measure of the reproducibility of analytical results.
- **Accuracy**: a measure of the bias that exists in a measurement system.
- **Representativeness**: degree that sampling data accurately and precisely depicts selected characteristics such as parameter variations at a sampling point or an environmental condition.

- **Completeness**: measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under "normal" conditions.
- **Comparability**: degree of confidence with which one data set can be compared to another.

To assess if environmental measurements are of an appropriate quality, the general requirements above will be examined and compared to agency-recommended parameters when available. Calculation of precision and accuracy should be specified in the site-specific work plan and/or SSQA. Samples should be collected in a manner so they are representative of both the chemical composition and physical state of the sample at the time of sampling. To ensure comparability, all data will be reported as ^{o} Celsius (flash point), pH units, µg/l or mg/l for water, liquids, µg/kg or mg/kg for soil, sediment or other solids, and mg/m^3 for air. Comparability is further addressed by using appropriate field and laboratory methods that are consistent with current standards of practice as approved by EPA.

A.8 SPECIAL TRAINING/CERTIFICATION

Sample collectors are required to successfully complete a 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) site safety course in accordance with 40 CFR Part 311, which references 29 CFR 1910.120. Staff are also expected to be trained on sampling for hazardous materials as well as read and be familiar with applicable SOPs, the generic QAPP, the site-specific work plan(s) and the SSQA prior to performing actual sample collection.

Specific training requirements may be necessary for personnel operating field analytical or sampling equipment or specialized equipment, such as an X-ray Fluorescence (XRF) analyzer or geophysical instruments. Manufacturer's requirements and recommendations should be followed.

The contractor will ensure and provide for the protection of the personal safety and health of all its workers on site, including the selection, provision, testing, decontamination, and disposal of all Personal Protective Equipment (PPE) and any required medical monitoring. The contractor will comply with all applicable worker safety and health laws and regulations. At all times during performance of services, the contractor will exercise reasonable professional judgement regarding safety and will use professional judgement as a criterion for cessation of services for safety reasons.

A.9 DOCUMENTS AND RECORDS

Documentation procedures should be conducted in accordance with EPA's record keeping requirements. Work plans and final reports will be generated and submitted to BVCP for review and approval.

Field QA/QC documentation for site characterization reports and/or remedial action/risk management reports must consider the following details:

- Calibration and maintenance records for field instrumentation,

- Documentation of sample collection procedures,
- Reporting of any variances made in the field to sampling plans, SOPs or other applicable guidance documents,
- Reporting of all field analysis results,
- Documentation of sample custody (provide copies of chain-of-custody documents),
- Documentation of sample preservation, handling and transportation procedures,
- Documentation of field decontamination procedures (and if applicable, collection and analysis of equipment rinsate blanks),
- Collection and analysis of all required duplicate, replicate, background and trip blank samples, and
- Documentation of disposal of investigation-derived wastes.

Laboratory QA/QC documentation for site characterization reports and/or remedial action/risk management reports must consider the following details:

- If the published analytical method used specifies QA/QC requirements within the method, those requirements must be met and the QA/QC data reported with the sample results;
- At a minimum, QA/QC samples must consist of the following items (where applicable): method/instrument blank, extraction/digestion blank, initial calibration information, initial calibration verification, continuing calibration verification, laboratory fortified blanks/laboratory control samples, duplicate, and matrix spikes/matrix spike duplicates;
- Documentation of appropriate instrument performance data such as internal standard and surrogate recovery.

B: DATA GENERATION AND ACQUISITION

B.1 SAMPLING PROCESS DESIGN

This QAPP is generic, covering many different projects and a large number of analytes in various complex sample matrices. The sampling design will vary depending on the goal of the sampling activity, such as site characterization or confirmatory sampling. Therefore, the sampling process design will be described in detail in the site-specific work plan and/or SSQA. Some considerations when developing a plan for a sampling design, particularly a judgmental sampling design, include potential contaminant(s) and locations based on past property uses, soil properties that affect contaminant migration, physical and chemical nature of potential contaminant(s), the manner in which contaminant(s) may have been released, and timing, duration and amount of potential release(s).

All QC samples will be collected in accordance with EPA guidance and described in the site-specific work plan. All QC samples will be documented in the sampling report. See Section B.5 for more information on QC samples.

B.2 SAMPLING METHODS

The field investigations and sample collection activities under the project will adhere to applicable SOPs and available EPA guidance and will be described in the site-specific work plan and/or SSQA. The site-specific work plan will indicate the location, type, number and media of the samples.

Manufacturer's specifications and operational instructions, other agency SOPs, other methods, instructions, including professional or scientific technical standards, may also be used for specific field analytical equipment, geophysical equipment, surveying instruments, etc. with no existing SOPs or EPA guidance upon approval of the BVCP Project Manager. The site-specific work plan will specify sampling methodologies and procedures used.

B.3 SAMPLE HANDLING AND CUSTODY

Sample handling and custody will be accomplished according to SOPs and using standard forms developed by contractor's laboratories. Sample container selection will be according to appropriate method guidance and/or SOPs. The site-specific work plan will specify sample handling procedures, sample containers, preservation, holding times, chain-of-custody and field documentation, handling of samples in the field, and transport of samples to the laboratory. All analyses will be conducted within the EPA-specified maximum sample holding time limits. Any data obtained from analyses conducted on samples after the specified holding time limit will be qualified by the laboratory in sample result documentation and discussed in the sampling report.

B.4 ANALYTICAL METHODS

Field analytical measurements will be according to SOPs and manufacturer's operational instructions, such as immunoassay kit instructions, photoionization detector (PID) instructions, XRF manual, etc. Calibration and other QA/QC actions will be accomplished according to SOPs, manufacturer's minimum recommendations/ requirements and other appropriate scientific or technical standards. Appropriate EPA guidance, SOPs, best professional judgement and accepted industry and scientific practices will be used when correlating field analytical data to definitive data.

Laboratory measurements will be performed by the selected laboratory according to the method requested, generally according to EPA Solid Waste Methods SW-846 specified container, preparation and analytical methods. The QC procedures specified in these methods must be followed. The detection limits of the selected analytical methods generally will be able to achieve the concentrations of interest needed. Analytical parameters will vary by project; therefore, the analytical methods used for the parameters of concern should be specified in the site-specific work plan and/or SSQA.

All QC documentation must be provided with each analytical deliverable package. The contractor will be responsible for ensuring all analytical data provided by the contractor's laboratory for the project meets the contract requirements and the requirements of this QAPP.

B.5 QUALITY CONTROL

QC samples will be required to verify the validity of analytical results and to assess whether the samples were contaminated from sources not directly attributable to releases at the site (such as improper decontamination, cross-contamination, laboratory contamination, etc.). Field QC samples may include trip blanks, field blanks, equipment blanks/rinsate samples, replicates/field duplicates as appropriate. The field QC samples proposed for collection will be included in the site-specific work plan. Trip blanks indicate if any activities after obtaining the trip blank may have contaminated samples during transport. Field blanks are samples obtained in the field to determine if contaminants were introduced by sample containers, preservatives, sampling procedures, etc. Replicate samples may be obtained to assess the reproducibility of the sampling procedures, data obtained and the analytical methods. Rinsate samples are obtained to verify adequate decontamination of sampling equipment. For all projects involving the collection of aqueous samples, a trip blank will be included at a frequency of one per separate sampling event (mobilization). An equipment rinsate blank will be collected for projects where the sampling equipment is decontaminated in the field for reuse. The equipment rinsate blank will be collected at a frequency of one per separate sampling event (mobilization) for each different combination of sampling equipment, decontamination method, and analytical parameter.

Contaminants should not be detected above the laboratory reporting level in trip blanks, field blanks, and equipment rinse blanks. Any data that do not meet these accuracy criteria will be qualified on sample results. The BVCP Project Manager and contractor personnel will evaluate all qualified data on a project-specific basis, and determine how/whether to use the data.

Total precision of the entire sampling and analytical process will be assessed using analyses of blind field duplicate and replicate split samples. Aqueous precision QC samples will be collected as duplicates, while non-aqueous precision QC samples will be sampled as replicate splits.

At least one set of precision QC samples for each media (groundwater, surface water, soil/sediment, air) should be collected per site. All QC samples will be documented in the sampling report, and should be collected at a frequency in accordance with applicable SOPs.

Laboratory QC samples include duplicates, spikes, laboratory blanks, and performance evaluation samples, and are performed by the fixed laboratory according to the approved laboratory QA/QC plans.

B.6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

Field analytical instruments used during this project will be maintained and calibrated according to instructions provided by the instrument manufacturer, and other appropriate scientific and technical guidance and standards pertinent to the specific instrument in use. The contractor will be responsible for performing operational checks on all field

equipment prior to use in the field. An operational problem with any field instrumentation will be noted by the contractor in the field notebook. Daily or regular calibration of field instrumentation will be according to applicable SOPs and manufacturer's instructions and indicated or referenced in the site-specific work plan.

Fixed laboratory equipment for contract laboratories used for quantitative sample analysis will be tested, inspected, calibrated and maintained according to the specific analytical equipment requirements as stated in the SOPs of the laboratory, in accordance with manufacturer-specified procedures or method-specified procedures, as appropriate.

B.7 INSTRUMENT/EQUIPMENT CALLIBRATION AND FREQUENCY

Maintenance and calibration procedures will be conducted in accordance with manufacturers' instrument manuals, method-specified procedures and the laboratory SOPs, as appropriate.

B.8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Inspection and acceptance of supplies and consumables will be conducted according to applicable SOPs. Any supplies and consumables used in the sample collection process or instrument calibration such as sample bottles, bailers, dedicated tubing, deionized water, calibration gases, etc., will be inspected upon receipt and prior to use.

B.9 NON-DIRECT MEASUREMENTS

Several types of data and information may be obtained from non-measurement sources for use in projects conducted under this QAPP. The primary types of non-measurement data are Phase I Environmental Site Assessments, site reconnaissance, interviews of site owners or operators, published reference books and resources, databases, and internet resources. These data may be used to design sampling plans and may be used with the directly measured data collected during each project to evaluate the potential need for further site characterization, remediation and/or suitability for development. Non-direct measurement data will be documented and referenced in any document for which they are used.

B.10 DATA MANAGEMENT

Data management, including chain-of-custody review and correction, data review, reduction and transfer to data management systems, quality control charts, quality control procedures, and sample receipt, storage and disposal, will be in accordance with applicable SOPs and accepted industry practices.

Documentation will be in accordance with applicable SOPs and accepted industry practices, and will include the sampling reports, copy of the chain-of-custody, and field QA controls with the analytical results. All sample documents will be legibly written in ink. Any corrections or revisions to sample documentation shall be made by lining through the original entry and initialing and dating any changes. Data reduction will occur in accordance with contractor analytical SOPs for each parameter. If difficulties are encountered during sample collection or sample analyses, a brief description of the

problem will be provided in the sampling report prepared by contractor. Data reporting will be in accordance with applicable SOPs and will include, at a minimum:

- Sample documentation (location, date and time of collection and analysis, etc.)
- Chain-of-custody forms
- Initial and continuing calibration
- Determination and documentation of detection limits
- Analyte(s) identification
- Analyte(s) quantitation
- Quality Control sample results
- Duplicate results

Adequate precautions will be taken during the reduction, manipulation, and storage of data in order to prevent the introduction of errors or the loss or misinterpretation of data.

C: ASSESSMENT AND OVERSIGHT

C.1 ASSESSMENTS AND RESPONSE ACTIONS

This section describes the internal and external checks necessary to ensure that all elements of the QAPP are implemented correctly as prescribed, that the quality of the data generated by implementation of the QAPP is adequate, and that any necessary corrective actions are implemented in a timely manner.

C.1.1 Laboratory Performance Assessment

Laboratories will comply with all of the EPA and the National Environmental Laboratory Accreditation Conference (NELAC) requirements for laboratory QA programs. Data resulting from the participation in this program shall be reviewed by the laboratory Quality Assurance Manager and any problems shall be addressed.

C.1.2 Field Performance Assessment

The auditor in charge of field QA will conduct audits of field activities according to contractor QA field auditing procedures. The process of choosing when field audits are conducted is not based on a particular project or site-sampling event, but rather on assuring that each person involved in sample collection is audited at least once per year. The contractor's field QA auditor will have the responsibility for initiating and implementing response actions associated with findings identified during the field audit. The field personnel shall properly address any response actions needed.

C.1.3 Overall QAPP Assessment

EPA conducts periodic evaluations of the state's environmental programs. These evaluations normally include some type of review of the program's quality management system, and may include examination of QAPPs.

C.1.4 Data Validation

All field and laboratory data will be subject to validation to review for accuracy, precision, completeness, representativeness and comparability. Data validation is discussed in more detail in Section D. The acceptance criteria for measurement data are discussed in Section A.6.

C.2 REPORTS TO MANAGEMENT

Data from the contractor's laboratory will be submitted to the BVCP Project Manager as an appendix to the final report using the laboratory analytical report sheets. The report sheets will include documentation of the sampling location, sample description, date of collection, collector, analysis performed and results, date of analysis, and analytical method used. A copy of the chain-of-custody and the lab results should also be attached to the final report. In addition, an explanation of any deficiencies in data quality should be provided with the sampling report.

Field performance assessment audits will be documented by the contractor's field QA auditor in a written report that will be kept on file at the contractor's office. Results from the laboratory's audit studies will be kept on file at contractor's office.

Comments and recommendations from the EPA Region VII periodic evaluations of state environmental programs are provided to the DEQ QA manager and used by DEQ management and staff to take any corrective actions which may be needed.

D: DATA VALIDATION AND USABILITY

D.1 DATA REVIEW, VERIFICATION AND VALIDATION

To ensure that measurement data generated when performing environmental sampling activities are of an appropriate quality, all data will be validated. Data validation is a systematic procedure for reviewing a body of data against a set of established criteria to provide a specified level of assurance of its validity prior to its intended use. The techniques used must be applied to the body of the data in a systematic and uniform manner. The process of data validation must be close to the origin of the data, independent of the data production, and objective in its approach. All data, as applicable, will be validated in accordance with EPA guidance, per Data Quality Objectives Process. Any deviations will be documented and provided with the analytical data report.

D.2 VERIFICATION AND VALIDATION METHODS

D.2.1 Documentation, Data Reduction and Reporting

Documentation will include the sampling reports, copy of the chain-of-custody, and field QA controls with the analytical results. Data reduction will occur in accordance with the laboratory's analytical SOPs for each parameter. If difficulties are encountered during sample analyses, a brief description of the problem will be provided.

Data derived from sampling events undertaken for projects under the oversight of the BVCP will be reported to the BVCP Project Manager as discussed in Section C.2. Reports to Management.

D.2.2 Data Validation

Data validation will occur as described in the analytical SOPs for each parameter and the laboratory SOPs for data review. Data validation is accomplished using control charts and data review checklists. Discrepancies are noted in the analytical file and appropriate data flags are used. If data is determined to be outside of control limits, the data is flagged on the report of analysis.

The laboratory personnel will look at matrix spikes/matrix spike duplicates, lab blanks, and lab duplicates to ensure they are acceptable. The sample collector will compare the sample descriptions with the field sheets for consistency and ensure that any anomalies in the data are documented. The contractor will perform a final review and approval to ensure that the data meets the quality objectives of this QAPP and, if applicable, the SSQA. The contractor's review and approval is a check on the reviews conducted by the laboratory to ensure consistency of all field and analytical data that is generated by the contractor.

D.3 RECONCILIATION WITH USER REQUIREMENTS

Once the final report is submitted, the BVCP Project Manager will review the field duplicates to determine if they appear to indicate a problem with meeting quality objectives. If problems are indicated, the BVCP Project Manager will contact the contractor to discuss and attempt to reconcile the issue. Completeness will also be evaluated to determine if the completeness goal for this project has been met. If data quality indicators do not meet the project's requirements as outlined in this QAPP and applicable SSQA, the data may be discarded and re-sampling may occur. The BVCP Project Manager will determine the cause of the failure (if possible) and make the decision to discard the data and re-sample. If the failure is tied to the analyses, calibration and maintenance techniques will be reassessed as identified by the appropriate lab personnel. If the failure is associated with the sample collection and re-sampling is needed, the sampling methods and procedures will be reassessed as identified by the field audit process.

Corrective action will be undertaken by all parties to address specific problems as they arise. Corrective actions required will be identified through the use of control charts for chemical analyses, precision and accuracy data, through performance auditing, and through systems audits.

REFERENCES

- EPA Guidance for Representative Sampling, OSWER Directives 9360.4-10 and 9360.4-16, December 1995.
- EPA Guidance for Quality Assurance Project Plans, EPA/600/R-98/018, February 1998.
- EPA Guidance for Data Quality Assessment, EPA/600/R-96/084, January 1998.
- EPA Guidance for Data Quality Objectives Process, EPA/600/R-96/055, September 1994.

APPENDIX A: LISTING OF ACRONYMS & TERMS

BVCP	Brownfields/Voluntary Cleanup Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DQO	Data Quality Objectives
EPA	United States Environmental Protection Agency
HAZWOPER	Hazardous Waste Operations and Emergency Response
MCL	Maximum Contaminant Level
MRBCA	Missouri Risk-based Corrective Action Process
NELAC	National Environmental Laboratory Accreditation Conference
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SOP	Standard Operating Procedure
SSQA	Site-Specific Quality Assurance Project Plan Addendum
SVOC	Semi-Volatile Organic Compound
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound

Duplicate or co-located sample is a sample obtained from the same location, at the same time, and of the same material as the original sample. Duplicate water samples are used primarily to assess precision associated with sampling methodology, and to a lesser extent sample heterogeneity and analytical procedures. Duplicate soil samples are used primarily to determine the variability or heterogeneity of the sampled media. Due to the heterogeneity of soils, caution must be used if attempting to assess precision associated with sampling methodology or analytical procedures.

Hazardous Substance means a substance defined as hazardous pursuant to federal rule 40 CFR 302.4, which includes asbestos and Polychlorinated Biphenyls (PCBs); any substance designated pursuant to Section 311(b)(2)(A) of the federal Water Pollution Control Act; any toxic pollutant listed under Section 307(a) of the federal Water Pollution Control Act; any hazardous air pollutant listed under Section 112 of the Clean Air Act; any imminently hazardous chemical substance or mixture with respect to which the Administration of EPA has taken action pursuant to Section 7 of the Toxic Substances Control Act; any hazardous waste; any hazardous material designated by the Secretary of the U.S. Department of Transportation under the Hazardous Materials Transportation Act; any radioactive materials; or any petroleum product.

Hazardous waste means waste defined to be hazardous pursuant to the Missouri Hazardous Waste Management Law Section 260.350 to Section 260.430 or pursuant to federal rule 40 CFR 261.

Replicate split sample is obtained by dividing or splitting one sample that has been mixed or homogenized into two samples for separate analysis. A replicate split is collected primarily to assess precision associated with analytical procedures and to a lesser extent sample handling procedures. Replicate split samples of soils or other non-aqueous materials are not recommended if volatile organics analyses are requested due to

the potential loss of the volatiles during the mixing process. Duplicate samples for volatile organics analyses are sometimes collected prior to mixing, however, there may be a greater potential for inconsistency due to the heterogeneous nature of soils or other non-aqueous media.

APPENDIX B: ANALYTICAL REQUIREMENTS

The detection limits, as specified in 40 CFR 136 Appendix A and the EPA SW-846 Methods, are sufficient for most project under the oversight of the BVCP. The accuracy and precision of each analytical method are determined by using spikes and spike duplicate analyses, as specified in the EPA SW-846 methods.